

Serial No. 09/615,305  
Filed July 13, 2000  
Response to Office Action

#### The Office Action

Claim 17 stands rejected under 35 U.S.C. 112, second paragraph, for use of the term "molecule".

Claims 1-20 stand rejected under 35 U.S.C. 102(b) as being anticipated by WO 97/49387.

Claims 1, 3-11, 16-20 stand rejected under 35 U.S.C. 102(b) as being anticipated by EP 552 802.

Claims 1, 2, 10, 12, 17, and 19 stand rejected under 35 U.S.C. 102(e) as being anticipated by U.S. 6,008,184 ("Pluyter").

Claims 1, 2, 10, 12, 17, and 19 stand rejected under 35 U.S.C. 102(a) as being anticipated by U.S. 5,891,468 ("Martin").

Claims 1-20, 27, and 28 stand rejected under 35 U.S.C. 103(a) as being obvious over WO 97/49387 by itself or in combination with Martin.

#### The Claimed Invention

As the claims have been amended, the claimed invention includes vesicles made from triblock amphiphilic ABA copolymers, where one of A or B is hydrophilic and the other is hydrophobic, which self-assemble when dispersed in oil or water. The vesicles are hollow. Vesicles are defined on page 4 as "spontaneously forming aggregates having a generally spherical shape and an interior void." The resulting vesicles will have hydrophobic and hydrophilic layers arranged depending on the type of copolymer used.

The claimed invention further includes nanocapsules formed by stabilizing the vesicles made from ABA copolymers. The nanocapsules are also hollow. Stabilization can be through crosslinking of the copolymers, such as crosslinking of end groups of the copolymers.

The claimed invention further includes nanocapsules formed by end-group stabilization of amphiphilic copolymers. The copolymers do not have to be triblock copolymers.

Active agents can be encapsulated within the vesicles and the nanocapsules and targeting molecules can be attached to the vesicles and nanocapsules.

#### Cited References

WO 97 /49387 teaches solid particles formed from amphiphilic copolymers. The copolymers are not unlike those used to form the vesicles and nanocapsules of the present invention. However, the particles, and the methods of making them, are very unlike the vesicles

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and nanocapsules of the claimed invention. The particles described in WO 97/49387 include a crosslinked shell domain and an interior core domain. The particles are made from micelles, which have a solid structure (without a hollow interior). Nowhere in WO 97/49387 is it disclosed that the interior of the particles is hollow. Accordingly, the particles described in WO 97/49387 cannot be used for encapsulation of active agents, or for carrying active agents in the interior void space, to function as nanoreactors, for example.

After the shells of the particles described in WO 97/49387 are crosslinked, the crosslinked shells of the particles are either hydrophilic or hydrophobic. They do not possess an amphiphilic nature per se that allows them to form a membrane-like superstructure similar to biological membranes as the amphiphilic polymers do in the vesicles and nanocapsules of the present invention. Accordingly, the structures described in WO 97/49387 do not allow a functional incorporation of natural membrane proteins. Such proteins would be of crucial importance to target the particles or to enable them to 'communicate' with their environment.

EPA 552 802 also teaches polymerizable copolymer micelles, and does not mention hollow vesicles or nanocapsules. While micelles and hollow vesicles may both be made from amphiphilic copolymers, the resulting structure is profoundly different. The hollow interior of the claimed vesicles and nanocapsules allows them to be used in a very different manner from the stabilized micelles of EP 552 802 (and WO 97/49387).

Pluyter describes the use of amphiphilic polymers to stabilize lamellar droplets- droplets formed from alternating concentric layers of water and lamellar cationic bilayers. These droplets tend to thicken and form a gel over time, which is undesirable. The amphiphilic copolymers do not form vesicles themselves but rather interact with the lamellar droplets ("vesicles") in one of two ways: adhering physically to the positively charged vesicle surface or incorporated into the lamellar vesicles (see col 2, ll 51-65).

Martin discloses conventional lipid vesicles (liposomes) to which amphiphilic diblock copolymers are added in order to alter the fusogenic ability of the liposome. See col. 5, ll 50-65.

As indicated above, hydrophilic polymer chains, such as such as segment 16 in conjugate 20, are included in liposome 10 as part of the diblock polymer moiety of vesicle-forming lipids on the outer surface of the liposomes. It will be appreciated that the hydrophilic polymer segment in a diblock conjugate functions to enhance the water solubility of the associated hydrophobic chain, to prevent destabilization of the liposome membrane by partitioning of the hydrophobic chains into the liposome bilayer region. As will be

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discussed below, such destabilization is advantageous in promoting liposome/cell membrane fusion, but is undesirable prior to the fusion event, i.e., during liposome storage, administration and biodistribution to a target site.

### Analysis

#### 112 Rejection

A "molecule" is defined in the Academic Press Dictionary of Science and Technology ([www.academicpress.com/insight/07131998/molecule.htm](http://www.academicpress.com/insight/07131998/molecule.htm)) as "the smallest unit of matter of a substance that retains all the physical and chemical properties of that substance, consisting of a single atom or a group of atoms bonded together; e.g., Ne, H<sub>2</sub>, H<sub>2</sub>O." Applicants have further defined the term "molecule" in the application at pages 19-22. It would be possible that only one molecule such as a large molecular weight lipid could be incorporated in the membrane. Accordingly, this rejection is traversed.

#### 102 Rejections

##### *WO 97/49387*

As discussed above, WO 97/49387 describes solid particles having a crosslinked shell domain and an interior core domain. The particles are made from micelles, which have a solid structure (without a hollow interior). Nowhere in WO 97/49387 is it disclosed that the interior of the particles is hollow. Accordingly, the reference does not anticipate the claimed vesicles or nanocapsules and this rejection is traversed.

##### *EP 552 802*

Also discussed above, EP 552 802 also describes polymerizable copolymer micelles, and does not mention hollow vesicles or nanocapsules. Accordingly, the reference does not anticipate the claimed vesicles or nanocapsules and this rejection is traversed.

##### *Pluyter*

Pluyter does not disclose vesicles having membranes formed from amphiphilic copolymers, as required by the claims. Rather, the vesicles taught by Pluyter are lamellar droplets having amphiphilic copolymers attached thereto. This rejection is traversed.

##### *Martin*

Martin also does not disclose vesicles having membranes formed from amphiphilic copolymers, as required by the claims. The vesicles taught by Martin are liposomes having a

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diblock amphiphilic copolymer attached thereto. Martin does not teach that the liposomes are stabilized. This rejection is traversed.

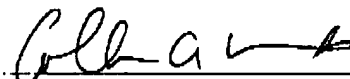
103 Rejection

Martin does not teach stabilizing vesicles to form nanocapsules. WO 97/49387 does not teach hollow vesicles. Accordingly, these references, taken alone or in combination, do not anticipate nor render the claimed invention obvious. This rejection is traversed.

Conclusion

None of the references that were cited teach or suggest vesicles or nanocapsules formed from triblock amphiphilic copolymers. None of the references teach or suggest nanocapsules formed by end group crosslinking vesicles formed from amphiphilic copolymers. Accordingly, it is respectfully submitted that the references are not appropriate as the basis of rejection of the claims.

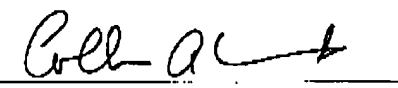
Respectfully submitted,

  
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Registration No. 38,824

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**Certificate of Facsimile Transmission Under 37 C.F.R. §1.8(a)**

I hereby certify that this paper, along with any paper referred to as being enclosed or attached, is being faxed to the United States Patent and Trademark Office TC 1600 before final fax number 703-872-9306 on the date shown below.

  
Collen A. Beard

Date: April 4, 2002

Serial No. 09/615,305

Filed July 13, 2000

Response to Office Action

Claims As Amended

1. (Once Amended) Vesicles comprising membranes formed from amphiphilic copolymers having hydrophobic and hydrophilic segments, wherein the copolymers are ABA copolymers, and wherein one of A and B is hydrophobic and the other is hydrophilic.
2. (Cancelled)
3. Nanocapsules formed by stabilization of the vesicles of claim 1.
4. (Once Amended) Nanocapsules formed by stabilization of vesicles comprising membranes formed from amphiphilic copolymers having hydrophobic and hydrophilic segments [The nanocapsules of claim 3], wherein the [copolymers] vesicles are stabilized by end group polymerization of the copolymers.
5. (Once Amended) The nanocapsules of claim 3 [4], wherein the [nanocapsules] vesicles are stabilized via crosslinking of the copolymers.
6. (Once Amended) The [vesicles] nanocapsules of claim 4 [1], wherein the copolymers are AB copolymers, wherein one of A and B is hydrophobic and the other is hydrophilic.
7. (Cancelled)
8. (Cancelled).
9. (Once Amended) The nanocapsules of claim 4 [8, wherein the nanocapsules are stabilized via crosslinking], wherein an active agent is encapsulated within the nanocapsule.
10. The vesicles of claim 1, wherein an active agent is encapsulated within the vesicle.
11. (Once Amended) The nanocapsules of claim 3, wherein an active agent is encapsulated within the [vesicle] nanocapsule.
12. (Once Amended) The vesicles of claim 1 [2], wherein the vesicles comprise a hydrophilic inner layer, a hydrophobic middle layer and a hydrophilic outer layer.
13. (Once Amended) The vesicles of claim 1 [2], wherein the vesicles comprise a hydrophobic inner layer, a hydrophilic middle layer and a hydrophobic outer layer.
14. (Once Amended) The vesicles of claim 1 [2], wherein the copolymers are U-shaped and the vesicles have a hydrophobic inner layer and a hydrophilic outer layer, or a hydrophilic inner layer and a hydrophobic outer layer.

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15. (Cancelled)
16. The nanocapsules of claim 4, wherein the polymerization is via photopolymerization.
17. The vesicles of claim 1, wherein a molecule is incorporated into the vesicle membrane.
18. The nanocapsules of claim 3, wherein the hollow morphology of the nanocapsules is preserved when the nanocapsules are dry.
19. The vesicles of claim 1, wherein the vesicles are biodegradable.
20. The nanocapsules of claim 3, wherein the nanocapsules are biodegradable.
- 21- 26. (Cancelled)
27. The vesicles of claim 1 further comprising targeting molecules bound to the surface of the vesicles.
28. The vesicles of claim 27 wherein the targeting molecules are selected from the group consisting of carbohydrates, proteins, folic acid, peptides, peptoids, and antibodies.
29. (New Claim) The nanocapsules of claim 4, wherein the hollow morphology of the nanocapsules is preserved when the nanocapsules are dry.
30. (New Claim) The nanocapsules of claim 4, wherein the nanocapsules are biodegradable.

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Response to Office Action

Clean Copy of Claims as Amended

- a1  
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B1
1. (Once Amended) ~~Vesicles~~ comprising membranes formed from amphiphilic copolymers having hydrophobic and hydrophilic segments, wherein the copolymers are ABA copolymers, and wherein one of A and B is hydrophobic and the other is hydrophilic.
2. (Cancelled)
3. Nanocapsules formed by stabilization of the vesicles of claim 1.
- a2
4. (Once Amended) Nanocapsules formed by stabilization of vesicles comprising membranes formed from amphiphilic copolymers having hydrophobic and hydrophilic segments, wherein the vesicles are/stabilized by end group polymerization of the copolymers.
5. (Once Amended) The nanocapsules of claim 3, wherein the vesicles are stabilized via crosslinking of the copolymers.
6. (Once Amended) The nanocapsules of claim 4, wherein the copolymers are AB copolymers, wherein one of A and B is hydrophobic and the other is hydrophilic.
7. (Cancelled)
8. (Cancelled).
9. (Once Amended) The nanocapsules of claim 4, wherein an active agent is encapsulated within the nanocapsule.
10. The vesicles of claim 1, wherein an active agent is encapsulated within the vesicle.
11. (Once Amended) The nanocapsules of claim 3, wherein an active agent is encapsulated within the nanocapsule.
- a3
12. (Once Amended) The vesicles of claim 1, wherein the vesicles comprise a hydrophilic inner layer, a hydrophobic middle layer and a hydrophilic outer layer.
13. (Once Amended) The vesicles of claim 1, wherein the vesicles comprise a hydrophobic inner layer, a hydrophilic middle layer and a hydrophobic outer layer.
14. (Once Amended) The vesicles of claim 1, wherein the copolymers are U-shaped and the vesicles have a hydrophobic inner layer and a hydrophilic outer layer, or a hydrophilic inner layer and a hydrophobic outer layer.
15. (Cancelled)

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16. The nanocapsules of claim 4, wherein the polymerization is via photopolymerization.

17. The vesicles of claim 1, wherein a molecule is incorporated into the vesicle membrane.

18. The nanocapsules of claim 3, wherein the hollow morphology of the nanocapsules is preserved when the nanocapsules are dry.

19. The vesicles of claim 1, wherein the vesicles are biodegradable.

20. The nanocapsules of claim 3, wherein the nanocapsules are biodegradable.

21- 26. (Cancelled)

27. The vesicles of claim 1 further comprising targeting molecules bound to the surface of the vesicles.

28. The vesicles of claim 27 wherein the targeting molecules are selected from the group consisting of carbohydrates, proteins, folic acid, peptides, peptoids, and antibodies.

29. (New Claim) The nanocapsules of claim 4, wherein the hollow morphology of the nanocapsules is preserved when the nanocapsules are dry.

30. (New Claim) The nanocapsules of claim 4, wherein the nanocapsules are biodegradable.



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Page 001

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE****In Re Application of Meier, W. et al.****Filing Date: July 13, 2000****Examiner: G. Kishore****Serial No.: 09/615,305****Art Unit: 1615****Title: Amphiphilic Copolymer Vesicles**Assistant Commissioner for Patents  
Washington DC 20231**RESPONSE TO FIRST OFFICE ACTION**

Sir:

The following comments and amendments are submitted in response to the Office Action mailed on December 5, 2001. This Response is accompanied by a Request for a one month extension of time pursuant to 37 CFR 1.136(a) and a credit card authorization form for the required fee of \$110.00.

**Claim Amendments**

Independent claim 1 has been amended to specifically recite that the vesicle membranes are made from amphiphilic ABA triblock copolymers, wherein one of A and B is hydrophobic and the other is hydrophilic.

Claim 4 has been rewritten into independent form, containing the elements of claims 3 and 4.

Claims 2, 7, 8, 15, and 21-26 have been cancelled

New claims 29 and 30 have been added.

The other claim amendments are made to conform the claims to the amendments made to claims 1 and 4. All of the amendments are supported by the specification and claims as originally filed.

Claims 1, 3-6, 9-14, 16-20, and 27-30 are pending.

**The Office Action**

Claim 17 stands rejected under 35 U.S.C. 112, second paragraph, for use of the term "molecule".

Claims 1-20 stand rejected under 35 U.S.C. 102(b) as being anticipated by WO 97/49387.

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Claims 1, 2, 10, 12, 17, and 19 stand rejected under 35 U.S.C. 102(a) as being anticipated by U.S. 5,891,468 ("Martin").

Claims 1-20, 27, and 28 stand rejected under 35 U.S.C. 103(a) as being obvious over WO 97/49387 by itself or in combination with Martin.

#### The Claimed Invention

As the claims have been amended, the claimed invention includes vesicles made from triblock amphiphilic ABA copolymers, where one of A or B is hydrophilic and the other is hydrophobic, which self-assemble when dispersed in oil or water. The vesicles are hollow. Vesicles are defined on page 4 as "spontaneously forming aggregates having a generally spherical shape and an interior void." The resulting vesicles will have hydrophobic and hydrophilic layers arranged depending on the type of copolymer used.

The claimed invention further includes nanocapsules formed by stabilizing the vesicles made from ABA copolymers. The nanocapsules are also hollow. Stabilization can be through crosslinking of the copolymers, such as crosslinking of end groups of the copolymers.

The claimed invention further includes nanocapsules formed by end-group stabilization of amphiphilic copolymers. The copolymers do not have to be triblock copolymers.

Active agents can be encapsulated within the vesicles and the nanocapsules and targeting molecules can be attached to the vesicles and nanocapsules.

#### Cited References

WO 97/49387 teaches solid particles formed from amphiphilic copolymers. The copolymers are not unlike those used to form the vesicles and nanocapsules of the present invention. However, the particles, and the methods of making them, are very unlike the vesicles and nanocapsules of the claimed invention. The particles described in WO 97/49387 include a crosslinked shell domain and an interior core domain. The particles are made from micelles, which have a solid structure (without a hollow interior). Nowhere in WO 97/49387 is it disclosed that the interior of the particles is hollow. Accordingly, the particles described in WO

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97/49387 cannot be used for encapsulation of active agents, or for carrying active agents in the interior void space, to function as nanoreactors, for example.

After the shells of the particles described in WO 97/49387 are crosslinked, the crosslinked shells of the particles are either hydrophilic or hydrophobic. They do not possess an amphiphilic nature per se that allows them to form a membrane-like superstructure similar to biological membranes as the amphiphilic polymers do in the vesicles and nanocapsules of the present invention. Accordingly, the structures described in WO 97/49387 do not allow a functional incorporation of natural membrane proteins. Such proteins would be of crucial importance to target the particles or to enable them to 'communicate' with their environment.

EPA 552 802 also teaches polymerizable copolymer micelles, and does not mention hollow vesicles or nanocapsules. While micelles and hollow vesicles may both be made from amphiphilic copolymers, the resulting structure is profoundly different. The hollow interior of the claimed vesicles and nanocapsules allows them to be used in a very different manner from the stabilized micelles of EP 552 802 (and WO 97/49387).

Pluyter describes the use of amphiphilic polymers to stabilize lamellar droplets- droplets formed from alternating concentric layers of water and lamellar cationic bilayers. These droplets tend to thicken and form a gel over time, which is undesirable. The amphiphilic copolymers do not form vesicles themselves but rather interact with the lamellar droplets ("vesicles") in one of two ways: adhering physically to the positively charged vesicle surface or incorporated into the lamellar vesicles (see col 2, ll 51-65).

Martin discloses conventional lipid vesicles (liposomes) to which amphiphilic diblock copolymers are added in order to alter the fusogenic ability of the liposome. See col. 5, ll 50-65.

As indicated above, hydrophilic polymer chains, such as segment 16 in conjugate 20, are included in liposome 10 as part of the diblock polymer moiety of vesicle-forming lipids on the outer surface of the liposomes. It will be appreciated that the hydrophilic polymer segment in a diblock conjugate functions to enhance the water solubility of the associated hydrophobic chain, to prevent destabilization of the liposome membrane by partitioning of the hydrophobic chains into the liposome bilayer region. As will be discussed below, such destabilization is advantageous in promoting liposome/cell membrane fusion, but is undesirable prior to the fusion event, i.e., during liposome storage, administration and biodistribution to a target site.

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### Analysis

#### 112 Rejection

A "molecule" is defined in the Academic Press Dictionary of Science and Technology ([www.academicpress.com/inscight/07131998/molecule.htm](http://www.academicpress.com/inscight/07131998/molecule.htm)) as "the smallest unit of matter of a substance that retains all the physical and chemical properties of that substance, consisting of a single atom or a group of atoms bonded together; e.g., Ne, H<sub>2</sub>, H<sub>2</sub>O." Applicants have further defined the term "molecule" in the application at pages 19-22. It would be possible that only one molecule- such as a large molecular weight lipid could be incorporated in the membrane. Accordingly, this rejection is traversed.

#### 102 Rejections

##### *WO 97/49387*

As discussed above, WO 97/49387 describes solid particles having a crosslinked shell domain and an interior core domain. The particles are made from micelles, which have a solid structure (without a hollow interior). Nowhere in WO 97/49387 is it disclosed that the interior of the particles is hollow. Accordingly, the reference does not anticipate the claimed vesicles or nanocapsules and this rejection is traversed.

##### *EP 552 802*

Also discussed above, EP 552 802 also describes polymerizable copolymer micelles, and does not mention hollow vesicles or nanocapsules. Accordingly, the reference does not anticipate the claimed vesicles or nanocapsules and this rejection is traversed.

##### *Pluyter*

Pluyter does not disclose vesicles having membranes formed from amphiphilic copolymers, as required by the claims. Rather, the vesicles taught by Pluyter are lamellar droplets having amphiphilic copolymers attached thereto. This rejection is traversed.

##### *Martin*

Martin also does not disclose vesicles having membranes formed from amphiphilic copolymers, as required by the claims. The vesicles taught by Martin are liposomes having a diblock amphiphilic copolymer attached thereto. Martin does not teach that the liposomes are stabilized. This rejection is traversed.

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103 Rejection

Martin does not teach stabilizing vesicles to form nanocapsules. WO 97/49387 does not teach hollow vesicles. Accordingly, these references, taken alone or in combination, do not anticipate nor render the claimed invention obvious. This rejection is traversed.

Conclusion

None of the references that were cited teach or suggest vesicles or nanocapsules formed from triblock amphiphilic copolymers. None of the references teach or suggest nanocapsules formed by end group crosslinking vesicles formed from amphiphilic copolymers. Accordingly, it is respectfully submitted that the references are not appropriate as the basis of rejection of the claims.

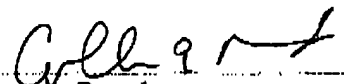
Respectfully submitted,

  
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Collen A. Beard

Date: *April 4, 2002*

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Filed July 13, 2000  
Response to Office Action

Claims As Amended

1. (Once Amended) Vesicles comprising membranes formed from amphiphilic copolymers having hydrophobic and hydrophilic segments, wherein the copolymers are ABA copolymers, and wherein one of A and B is hydrophobic and the other is hydrophilic.
2. (Cancelled)
3. Nanocapsules formed by stabilization of the vesicles of claim 1.
4. (Once Amended) Nanocapsules formed by stabilization of vesicles comprising membranes formed from amphiphilic copolymers having hydrophobic and hydrophilic segments [The nanocapsules of claim 3], wherein the [copolymers] vesicles are stabilized by end group polymerization of the copolymers.
5. (Once Amended) The nanocapsules of claim 3 [4], wherein the [nanocapsules] vesicles are stabilized via crosslinking of the copolymers.
6. (Once Amended) The [vesicles] nanocapsules of claim 4 [1], wherein the copolymers are AB copolymers, wherein one of A and B is hydrophobic and the other is hydrophilic.
7. (Cancelled)
8. (Cancelled).
9. (Once Amended) The nanocapsules of claim 4 [8], wherein the nanocapsules are stabilized via crosslinking], wherein an active agent is encapsulated within the nanocapsule.
10. The vesicles of claim 1, wherein an active agent is encapsulated within the vesicle.
11. (Once Amended) The nanocapsules of claim 3, wherein an active agent is encapsulated within the [vesicle] nanocapsule.
12. (Once Amended) The vesicles of claim 1 [2], wherein the vesicles comprise a hydrophilic inner layer, a hydrophobic middle layer and a hydrophilic outer layer.
13. (Once Amended) The vesicles of claim 1 [2], wherein the vesicles comprise a hydrophobic inner layer, a hydrophilic middle layer and a hydrophobic outer layer.
14. (Once Amended) The vesicles of claim 1 [2], wherein the copolymers are U-shaped and the vesicles have a hydrophobic inner layer and a hydrophilic outer layer, or a hydrophilic inner layer and a hydrophobic outer layer.

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15. (Cancelled)
16. The nanocapsules of claim 4, wherein the polymerization is via photopolymerization.
17. The vesicles of claim 1, wherein a molecule is incorporated into the vesicle membrane.
18. The nanocapsules of claim 3, wherein the hollow morphology of the nanocapsules is preserved when the nanocapsules are dry.
19. The vesicles of claim 1, wherein the vesicles are biodegradable.
20. The nanocapsules of claim 3, wherein the nanocapsules are biodegradable.
- 21- 26. (Cancelled)
27. The vesicles of claim 1 further comprising targeting molecules bound to the surface of the vesicles.
28. The vesicles of claim 27 wherein the targeting molecules are selected from the group consisting of carbohydrates, proteins, folic acid, peptides, peptoids, and antibodies.
29. (New Claim) The nanocapsules of claim 4, wherein the hollow morphology of the nanocapsules is preserved when the nanocapsules are dry.
30. (New Claim) The nanocapsules of claim 4, wherein the nanocapsules are biodegradable.



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Clean Copy of Claims as Amended

1. (Once Amended) Vesicles comprising membranes formed from amphiphilic copolymers having hydrophobic and hydrophilic segments, wherein the copolymers are ABA copolymers, and wherein one of A and B is hydrophobic and the other is hydrophilic.
2. (Cancelled)
3. Nanocapsules formed by stabilization of the vesicles of claim 1.
4. (Once Amended) Nanocapsules formed by stabilization of vesicles comprising membranes formed from amphiphilic copolymers having hydrophobic and hydrophilic segments, wherein the vesicles are stabilized by end group polymerization of the copolymers.
5. (Once Amended) The nanocapsules of claim 3, wherein the vesicles are stabilized via crosslinking of the copolymers.
6. (Once Amended) The nanocapsules of claim 4, wherein the copolymers are AB copolymers, wherein one of A and B is hydrophobic and the other is hydrophilic.
7. (Cancelled)
8. (Cancelled).
9. (Once Amended) The nanocapsules of claim 4, wherein an active agent is encapsulated within the nanocapsule.
10. The vesicles of claim 1, wherein an active agent is encapsulated within the vesicle.
11. (Once Amended) The nanocapsules of claim 3, wherein an active agent is encapsulated within the nanocapsule.
12. (Once Amended) The vesicles of claim 1, wherein the vesicles comprise a hydrophilic inner layer, a hydrophobic middle layer and a hydrophilic outer layer.
13. (Once Amended) The vesicles of claim 1, wherein the vesicles comprise a hydrophobic inner layer, a hydrophilic middle layer and a hydrophobic outer layer.
14. (Once Amended) The vesicles of claim 1, wherein the copolymers are U-shaped and the vesicles have a hydrophobic inner layer and a hydrophilic outer layer, or a hydrophilic inner layer and a hydrophobic outer layer.
15. (Cancelled)

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16. The nanocapsules of claim 4, wherein the polymerization is via photopolymerization.
17. The vesicles of claim 1, wherein a molecule is incorporated into the vesicle membrane.
18. The nanocapsules of claim 3, wherein the hollow morphology of the nanocapsules is preserved when the nanocapsules are dry.
19. The vesicles of claim 1, wherein the vesicles are biodegradable.
20. The nanocapsules of claim 3, wherein the nanocapsules are biodegradable.
- 21- 26. (Cancelled)
27. The vesicles of claim 1 further comprising targeting molecules bound to the surface of the vesicles.
28. The vesicles of claim 27 wherein the targeting molecules are selected from the group consisting of carbohydrates, proteins, folic acid, peptides, peptoids, and antibodies.
29. (New Claim) The nanocapsules of claim 4, wherein the hollow morphology of the nanocapsules is preserved when the nanocapsules are dry.
30. (New Claim) The nanocapsules of claim 4, wherein the nanocapsules are biodegradable.